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TABLE OF SPACE VEHICLES: 1973-1977.(U)

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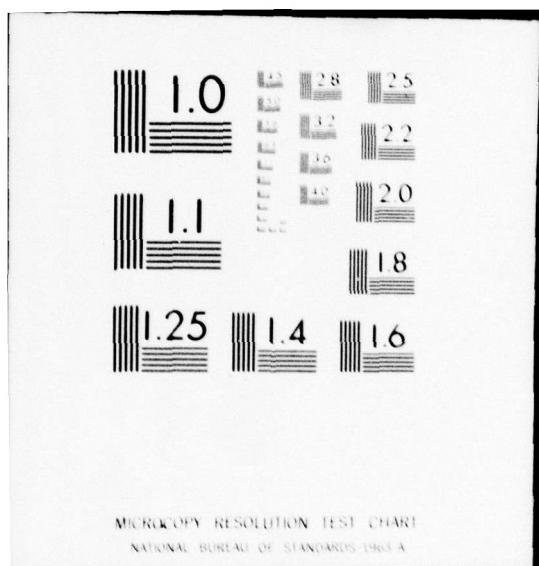
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TABLE OF SPACE VEHICLES: 1973-1977

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ROYAL AIRCRAFT ESTABLISHMENT

Technical Memorandum Space 256

Received for printing 2 February 1978

TABLE OF SPACE VEHICLES: 1973-1977

by

J. A. Pilkington*

SUMMARY

RAE Technical Report 73006 lists all space vehicles successfully launched before 31 December 1972. This Memorandum, which supersedes Technical Memorandum Space 242, extends the tabulation to the end of 1977, and gives amendments to Technical Report 73006.

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(A) Heliocentric orbits (continued)

Table 2 (continued)

Page 14

Name	Launch date (UT)	Mass (kg) and basic shape	Basic size (m)	Perihelion (AU)	Aphelion (AU)	Eccentricity	Inclination to ecliptic (deg)	Period (days)	Remarks
T Pioneer 10	1972-12A	1972 Mar 3.075	250 hexagon + dish	2.75 dia 1.45 long	0.991 0.98?	5.864 ∞	0.711 1.21	1.317 1.317	2318 - Passed 130400km behind Jupiter on 1973 Dec 4, 10
Pioneer 10 rocket	1972-12B	1972 Mar 3.075	66 sphere + nozzle	0.94 dia 1.32 long					Upgraded Surveyor Retrorocket
D Venus 8 [†] (capsule)	1972-21A	1972 Mar 27.177	495 sphere	1.0 dia	0.727	1.087	0.207	27	3137 Soft-landed on Venus day side 1972 July 22 at 09h 29m
D Venus 8 (compartiment)	1972-21E	1972 Mar 27.177	689 cylinder + 2 Vanes	1.22 dia 2.5 long	0.727	1.087	0.207	27	3137 Decayed in Venus atmosphere, 1972 July 22 at 08h 38m
Venus 9 rocket	1972-21D	1972 Mar 27.177	440 cylinder	2.0 dia 2.0 long		-	-	-	Orbit unknown
T Pioneer 11	1973-19A	1973 Apr 6.091	259 hexagon + dish	2.75 dia 1.45 long	1.000 0.98?	6.012 ∞	0.715 1.21	1.317 1.317	2398 Passed 41850km below Jupiter on 1974 Dec 3, 224
Pioneer 11 rocket	1973-19B	1973 Apr 6.091	66 sphere + nozzle	0.94 dia 1.32 long					Upgraded Surveyor Retrorocket

* Expected final path apex near R.A. 04h 33.0m; Declination 16.42°N. Occulted by Jovian satellite Io on 1974 Dec 4, 11.

** Expected to pass 24000km above Saturn's cloud tops (just outside rings) on 1973 Sep 5; and then past satellite Titan. Renamed 'Pioneer Saturn'.

† Parachute descent took 51min; surface transmissions lasted 50min.

(A) Heliocentric orbits (continued)

Table 2 (continued)

Page 14a

Name	Launch date (UT)	Mass (kg) and basic shape	Basic size (m)	Perihelion (AU)	Aphelion (AU)	Eccentricity	Inclination to ecliptic (deg)	Period (days)	Remarks
Mars 4 * orbiter	1973-47A	1973 Jul 21.813	3440? full cylinder + 2 panels	2.3 dia 2.7 long?	1.027	1.63?	0.23?	2.2?	556?
Mars 4 rocket	1973-47D	1973 Jul 21.813	1900? cylinder	3.9 dia 3.9 long?					Passed 2200km behind Mars on 1974 Feb 10
Mars 5 orbiter	1973-49A	1973 Jul 25.789	3440? full cylinder + 2 panels	2.3 dia 2.7 long?	1.01?	1.65?	0.24?	2.2?	Entered Areocentric orbit on 1974 Feb 12.66. See page 36
Mars 5 rocket	1973-49D	1973 Jul 25.789	1900? cylinder	3.9 dia 3.9 long?					Orbit probably similar to 1973-49A
Mars 6 compartment	1973-52A	1973 Aug 5.740	2060? empty cylinder + 2 panels	2.3 dia 2.7 long	1.01?	1.67?	0.24?	2.2?	567?
D Mars 6 capsule **	1973-52D	1973 Aug 5.740	1200? full 635 empty cone-sphere	2.5 dia 1.1 long	1.01?	1.67?	0.24?	2.2?	Passed 1600km behind Mars on 1974 Mar 12.38
Mars 6 rocket	1973-52E	1973 Aug 5.740	1900? cylinder	3.9 dia 3.9 long?					Soft landed on Mars 1974 Mar 12 at 24°S, 25°W
Mars 7 compartment	1973-53A	1973 Aug 9.708	2060? empty cylinder + 2 panels	2.3 dia 2.7 long	1.01?	1.69?	0.25?	2.2?	574?
Mars 7 capsule †	1973-53D	1973 Aug 9.708	1200? full 635 empty cone-sphere	2.5 dia 1.1 long	1.01?	1.69?	0.25?	2.2?	Passed 1300km behind Mars on 1974 Mar 9
									(Planned landing site 43°S, 42°W)

* Areocentric orbit insertion engine failed.

** Transmissions ceased on landing, at 09h 11m 05s UT
† Capsule separated from compartment correctly 48000km from Mars, but its small motor failed to put it on a collision course.

(A) Heliocentric orbits (continued)

Table 2 (continued)

Page 14b

Name	Launch date (UT)	Mass (kg) and basic shape	Basic size (m)	Perihelion (AU)	Aphelion (AU)	Eccentricity	Inclination to ecliptic (deg)	Period (days)	Remarks
Mars 7 rocket	1973 Aug 9.708	1900? cylinder	3.9 dia. 3.9 long?	0.70	1.11	0.23	2.6	317	Passed 5750km ahead of Venus 1974 Feb 5.71
Mariner 10*	1973 Nov 3.24	526 octagonal cylinder	1.27 dia. 2.90 long?	0.387	0.839	0.369	2.6	176	
Mariner 10 rocket	1973 Nov 3.24	1815 cylinder	3.05 dia 8.14 long	-	-	-	Orbit probably similar to 1973-85A	Centaur. Passed 45000km behind Venus	
Helios 1	1974 Dec 10.299	370 double- cone	1.75 to 2.77 dia	0.307	0.985	0.525	0	190	At perihelion on 1975 Mar 15.47
Helios 1 rocket	1974 Dec 10.299	66 sphere + nozzle	0.94 dia 1.32 long	-	-	-	Orbit probably similar to 1974-97A	Up-rated Surveyor Retrorocket	
Fragment	1974-97D	-	-	0.70?	1.11?	0.23?	2.3?	316?	Entered orbit round Venus on 1975 Oct 22.17.
Venus 9 orbiter	1975 Jun 8.109	3376 full cylinder + 2 panels	-	-	-	-	-	See Page 36b	
D Venus 9 lander**	1975 Jun 8.109	1550 sphere- annulus	-	0.70?	1.11?	0.23?	2.3?	316?	Soft landed on Venus day side on 1975 Oct 22 at 05h 13m
Venus 9 rocket	1975 Jun 8.109	1900? cylinder	3.9 dia 3.9 long?	-	-	-	Orbit probably similar to 1975-50A		

* Passed 700km ahead of Mercury (night side) on 1974 Mar 29.87;

passed 48000km below Mercury's South Pole on 1974 Sep 21.874;

passed 330km from Mercury on 1975 Mar 16.94. Transmissions ceased on 1975 Mar 24.

**Parachute descent took 75min; surface transmissions lasted 53min. Location - at 33°N, 293° long. (Inside region Beta).

Helios is German spacecraft
launched by US rocket.

(A) Heliocentric orbits (continued)

Table 2 (continued)

Page 14c

Name	Launch date (UT)	Mass (kg) and basic shape	Basic size (m)	Perihelion (AU)	Aphelion (AU)	Eccentricity	Inclination to ecliptic (deg)	Period (days)	Remarks
Venus 10 orbiter	1975-54A 1975 Jun 14.13	3473 full cylinder + 2 panels	-	0.707	1.117	0.237	2.37	3167	Entered orbit round Venus on 1975 Oct 25.17. See page 36b.
D Venus 10 lander *	1975-54D 1975 Jun 14.13	1560 sphere- annulus	-	0.707	1.117	0.237	2.37	3167	Soft-landed on Venus day side on 1975 Oct 25 at 05h 17.
Venus 10 rocket	1975-54E 1975 Jun 14.13	1900?	3.9 dia 3.9 long?	-	Ejected onto impact path	1975 Oct 23	-	-	-
T Viking 1 orbiter	1975-75A 1975 Aug 20.890	2325 full octagonal box + 4 vanes	3.3 high 1.8 wide 1.5 deep	1.003	1.572	0.250	4.48	565	Entered Areocentric orbit on 1976 Jun 19, then ejected lander
D Viking 1 lander	1975-75C 1975 Aug 20.890	1090 full 600 empty pyramid	2.1 high ** 3.0 wide 2.5 deep	1.003	1.572	0.250	4.48	565	Soft-landed on Mars 1976 Jul 20 at 12h 12m. Site 22.270N, 47.940W
Viking 1 rocket	1975-75B 1975 Aug 20.890	1815 cylinder	3.05 dia 8.14 long	-	Orbit similar to 1975-75A	-	-	-	-
T Viking 2 orbiter	1975-83A 1975 Sep 9.777	2325 full octagonal box + 4 vanes	3.3 high 1.8 wide 1.5 deep	1.006	1.669	0.248	2.92	565	Entered Areocentric orbit on 1976 Aug 7.47 then ejected lander
D Viking 2 lander	1975-83C 1975 Sep 9.777	1090 full 600 empty pyramid	2.1 high ** 3.0 wide 2.5 deep	1.006	1.669	0.248	2.92	565	Soft-landed on Mars 1976 Sep 3 at 22h 58m. Site 47.670N, 225.710W.
Viking 2 rocket	1975-83B 1975 Sep 9.777	1815 cylinder	3.05 dia 8.14 long	-	Orbit similar to 1975-83A	-	-	-	-

*Parachute descent took 75min; surface transmissions lasted 65min. Landed 2200km from Venus 9, at 15°N, 295° long.

**Including legs.
Viking areocentric orbits - see pages 36 and 36a.

(A) Heliocentric orbits (concluded)

Table 2 (continued)

Page 14d

Name	Launch Date (UT)	Mass (kg) and basic shape	Basic size (m)	Perihelion (AU)	Aphelion (AU)	Eccentricity	Inclination to ecliptic (deg)	Period (days)	Remarks
T Helios 2	1976-03A	1976 Jan 15.23	376 double-cone	1.75 to 2.77 dia 2.18 long	0.28	0.995	0.561	0	186 At perihelion on 1976 Apr 17
Helios 2 second stage	1976-03B	1976 Jan 15.23	1815 cylinder	3.05 dia 8.14 long	-	-	-	-	Centaur
Helios 2 rocket	1976-03C	1976 Jan 15.23	66 sphere + nozzle	0.94 dia 1.32 long	-	-	-	-	Upgraded Surveyor Retrorocket
T Voyager 2	1977-76A	1977 Aug 20.603	795 decagon + dish	1.9 and 3.7 dia 1.5 long	-	-	To exceed Solar escape velocity	-	Flyby of four outer planets*
Voyager 2 second stage	1977-76B	1977 Aug 20.603	1815 cylinder	3.05 dia 8.14 long	-	-	Unknown heliocentric orbit	-	Centaur
Voyager 2 rocket	1977-76C	1977 Aug 20.603	66 sphere + nozzle	0.94 dia 1.32 long	-	-	Orbit probably similar to 1977-76A	-	Upgraded Surveyor Retrorocket
T Voyager 1	1977-84A	1977 Sep 5.539	795 decagon + dish	1.9 and 3.7 dia 1.5 long	-	-	To exceed Solar escape velocity	-	Jupiter and Saturn flyby**
Voyager 1 second stage	1977-84B	1977 Sep 5.539	1815 cylinder	3.05 dia 8.14 long	-	-	Unknown heliocentric orbit	-	Centaur
Voyager 1 rocket	1977-84C	1977 Sep 5.539	66 sphere + nozzle	0.94 dia 1.32 long	-	-	Orbit probably similar to 1977-84A	-	Upgraded Surveyor Retrorocket

*To pass 642000km from Jupiter on 1979 Jul 10, Saturn on 1981 Aug 27, Uranus on 1986 Jan 31, and Neptune in 1989 Sep.

**To pass 177000km from Jupiter on 1979 Mar 5, and 209000km from Saturn on 1980 Nov 13.

(B) Orbits in the Earth-Moon system (continued)

Table 2 (continued)

Page 28

Name	Launch date (UT) and flight time	Mass (kg) and basic shape	Basic size (m)	Maximum distance from Earth (km)	Moon's age at launch (days)	All-burnt velocity km/s	Remarks
D Apollo 17 R (command module)	1972 Dec 7.23 12.58 days	5826 cone	3.91 dia 3.66 long	400000	1.4	10.90?	Orbited Moon 75 times. Landed on Earth 1972 Dec 19 at 19h 24m
D Apollo 17 (service module)	1972-96E	1972 Dec 7.23 12.57 days	24514 full cylinder	3.91 dia 7.49 long	400000	1.4	Attached to CM until decay in Earth's atmosphere on 1972 Dec 19 at 19h 14m
D Apollo 17 rocket	1972-96B	1972 Dec 7.23 87.0 hours?	13930 cylinder	6.6 dia 18.7 long	400000	1.4	Saturn IVE. Hit Moon 1972 Dec 10 at 20h 33m? Impact 4.2°S, 12.3°W
D LEM 12 T (AS + DS) (with LRV-3)	1972-96C	1972 Dec 7.23 4.60 days	16440 full box + octagon	4.09 high 3.76 wide 3.13 deep	400000	1.4	Soft landed on Moon 1972 Dec 11 at 19h 55m. Site 20.16°N, 30.75°E. AS relaunched from Moon *
D Luna 21 (with Lunokhod 2 **)	1973-01A	1973 Jan 8.289 7.65 days	56007 full pyramid + car	2.3 high 3.2 wide 3.3 deep	400000	3.6	Orbited Moon 40 times. Soft landed 1973 Jan 15 at 22h 35m. Position 26.5°N, 30.6°E
Luna 21 rocket	1973-01D	1973 Jan 8.288	1900?	3.9 dia 3.9 long?	-	3.6	Orbit unknown
Explorer 49 third stage	1973-39B	1973 Jun 10.592	66 sphere + nozzle	0.94 dia 1.32 long	390250	9.4	Burner 2. In high eccentricity orbit.
Luna 22 rocket	1974-37E	1974 May 29.373	1900?	3.9 dia 3.9 long?	-	7.5	Orbit unknown

* See page 35

** Lunokhod 2 mass 840kg

(B) Orbits in the Earth-Moon system (concluded)

Table 2 (continued)

Page 28a

Name	Launch date (UT) and flight time	Mass (kg) and basic shape	Basic size (m)	Maximum distance from Earth (km)	Moon's age at launch (days)	All-burnt velocity km/s	Remarks
D Luna 23* (AS + DS)	1974 Oct 28.60 8.63 days	5600? full pyramid • cylinder	3.1 high 3.2 wide 3.3 deep	400000	13.1	10.90?	Orbited Moon 53 times? Hard landed 1974 Nov 6 at 05h 37m. Position 13.5°N?; 56.5°E?
Luna 23 rocket	1974-84D	1974 Oct 28.60	1900? cylinder	-	13.1	10.90?	Orbit unknown
D Luna 24 (AS + DS)	1976-81A 8.65 days	5600? full pyramid • cylinder	3.1 high 3.2 wide 3.3 deep	400000	13.6	10.90?	Orbited Moon 53 times? Soft-landed 1976 Aug 18 at 05h 36m. Position 12.75°N, 62.2°E. AS relaunched from Moon **
Luna 24 rocket	1976-81F	1976 Aug 9.628	1900? cylinder	-	13.6	10.90?	Orbit unknown

* Damage on landing prevented re-launch of ascent stage.

**See page 35.

(C) Selenocentric orbits - Earth launch (continued)

Table 2 (continued)

Name	Launch date injection date and ejection date	Mass (kg) and basic shape	Basic size (m)	Date of orbital determination (UT)	Inclination to Moon's equator (deg)	Semi major axis (km)	Periselene height (km)	Aposelene height (km)	Orbital eccen- tricity
D Apollo 17 3M (CM + SM)	1972 Dec 7.23 1972 Dec 10.83 1972 Dec 16.98	30340 full cone-cylinder	3.91 dia 11.15 long	1972 Dec 10.83 1972 Dec 11.01 1972 Dec 11.78	159.9 159.9 159.9	128 115 118.8	1944 1807 1849	94 28 96	0.057 0.023 0.008
D LEM 12 (with LRV-3)	1972-96C	1972 Dec 7.23 1972 Dec 10.83 1972 Dec 11.83	4937 empty box + octagon 3.13 deep	1972 Dec 11.72 1972 Dec 11.79	159.9 159.9	115 114	1807 1800	28 13	0.023 0.027
D Luna 21 (with Lunokhod 2)	1973-01A	1973 Jan 8.288 1973 Jan 12.60	4000? full pyramid + car 3.2 wide	1973 Jan 12.60 1973 Jan 15.93	60 60	118 114	1838 1801	90 16	0.005 0.026
Explorer 49 (RAE 2)	1973-39A	1973 Jun 10.592 1973 Jun 15.26	200 cylinder + booms	1973 Jun 15.31 1973 Jun 20.16 1974 Aug 14 1975 Sep 1.0	38.26 38.71 55.34 76.2	241 221.2 221.9 222.0	2964 2797 2802 2803	1120 1053 1051 1020	1331 1065 1077 1109
Explorer 49 retorocket	1973-39F	1973 Jun 10.592 1973 Jun 15.26	134 full cone-cylinder	0.5 dia? 1.0 long?	Orbit similar to 1973-39A				
Fragment	1973-39G	1974 May 29.373	4000?	1974 Jun 2.7	19.58	130	1958	219	0.0
Luna 22	1974-37A	1974 Jun 2.68?	pyramid	1974 Jun 9 1974 Jun 13 1974 Nov 11.63 1975 Apr 2.33 1975 Aug 24	19.58 19.58 19.58 19.55 19.55	121 131 192 192 192	1873 1978 2542 2543 2542	25 181 171 200 30	244 299 1437 1409 1578
D Luna 23 (AS + DS)	1974-84A	1974 Oct 28.60 1974 Nov 1.91? 1974 Nov 6.23	4000? full pyramid + cylinder	1974 Nov 2 1974 Nov 6.22 1974 Nov 6.22	3.1 high 3.2 wide 3.3 deep	21 138 138	179 117 114	100 1837 1798	1286 94 104
									0.244 0.003 0.024

See pages 28 and 28a for further details of the above decayed satellites.

* Manoeuvring fuel exhausted on 1975 Sep 2

(C) Selenocentric orbits - Earth launch (concluded)

Table 2 (continued)

Page 33a

Name	Launch date injection date and ejection date	Mass (kg) and basic shape	Basic size (m)	Date of orbital determination (UT)	Inclination to Moon's equator (deg)	Period (min)	Semi major axis (km)	Periselene height (km)	Aposelene height (km)	Orbital eccen- tricity
D Luna 24 (AS + DS)	1976-81A 1976 Aug 9.628 1976 Aug 13.966 1976 Aug 18.275	4000 ⁷ full pyramid + cylinder	3.1 high 3.2 wide 3.3 deep	1976 Aug 14.0 1976 Aug 17	120 120	119 114	1653 1804	115 12	115 120	0 0.030

See page 28a for further details of the above decayed satellite.

(D) Selenocentric orbits - Moon Launch (concluded)

Table 2 (continued)

Name	Moon launch date and descent date	Mass (kg) and basic shape	Basic size (m)	Date of orbital determination (UT)	Inclination to Moon's equator (deg)	Period (min)	Semi major axis (km)	Periselene height (km)	Aposelene height (km)	Orbital eccentricity
D Luna 20 R ascent stage	1972-07A 1972 Feb 22.96 1972 Feb 25.80	8007 full cylinder + 3 spheres	2.3 high 1.6 wide 0.5 deep	1972 Apr 24.07 1972 Apr 24.14	169.3 169.3	114 120	1784 1850	17 98	75 126	0.017 0.008
2M LEM 11* ascent stage	1972-31C 1972 Apr 24.06	2134 empty box + 2 tanks	2.52 high 3.76 wide 3.13 deep	1972 Apr 24.14 1972 Dec 14.97	159.9 159.9	114 118.8	1784 1849	17 96	75 126	0.017 0.008
D LEM 12** ascent stage	1972-96C 1972 Dec 14.96 1972 Dec 15.29	2145 empty box + 2 tanks	2.52 high 3.76 wide 3.13 deep	1972 Dec 15.04 1972 Dec 15.04	159.9 159.9	114 118.8	1784 1849	17 96	75 126	0.017 0.008
D Luna 24 R ascent stage	1976-81E 1976 Aug 19.226 1976 Aug 22.747	8007 full cylinder + 3 spheres	2.3 high 1.6 wide 0.5 deep							

* Briefly docked with Apollo 16 for crew transfer on 1972 Apr 24.14. Still in orbit.

** Briefly docked with Apollo 17 for crew transfer on 1972 Dec 15.04. Sent crashing into Moon: 19.95°N, 30.73°E

(E) Areocentric orbits - Earth launch

Table 2 (continued)

Page 36

Name	Launch date injection date and ejection date	Mass (kg) and basic shape	Basic size (m)	Date of orbital determination (UT)	Inclination to Mars equator (deg)	Period (min)	Semi major axis (km)	Periaxis height (km)	Apoasis height (km)	Orbital eccen- tricity
Mars 2 orbiter	1971 May 19.68 1971 Nov 27.85	3440? full 2060? empty cylinder + 2 panels	2.3 dia 2.7 long	1971 Nov 27.85	48.9	1078	16585	1380	25000	0.712
D Mars 2 lander	1971-45E 1971 May 19.68 1971 Nov 27.85	1200? full 635 empty cone-sphere	2.5 dia 1.1 long	1971 Dec 2.57	Ejected onto impact path Hard-landed at 44°S, 47°E	1971 Dec 2.57	48.9?	15840	99495	190700
Mars 3 orbiter	1971-49A 1971 May 28.64 1971 Dec 2.57	3440? full 2060? empty cylinder + 2 panels	2.3 dia 2.7 long							
D Mars 3 lander	1971-49F 1971 May 28.64 1971 Dec 2.57	1200? full 635 empty cone-sphere	2.5 dia 1.1 long	1971 Nov 14.02	Ejected onto impact path Soft-landed at 45°S, 158°W	1971 Nov 14.02	64.28	754	13051	1397
Mariner 9	1971-51A 1971 May 30.93 1971 Nov 14.02	520 empty octagon + 2 tanks	1.38 dia 2.29 long							
Mars 5 orbiter	1973-49A 1973 Jul 25.79 1974 Feb 12.66	3440? full 2060? empty box + 2 vanes	2.3 dia 2.7 long	1974 Feb 12.66	35.0	1493	20525	1760	32500	0.749
T Viking 1 orbiter	1975-75A 1975 Aug 20.89 1976 Jun 19	2325 full 950? empty box + 4 vanes	3.3 high 1.8 wide 1.5 deep	1976 Jun 19 1976 Jun 21	37.8?	2544	29445	1500	50600	0.834*
D Viking 1 lander	1975-75C 1976 Jun 19 1976 Jul 20.51	1090 full 600 empty pyramid	2.1 high 3.0 wide 2.5 deep	1976 Jun 21	37.8	1476	20444	1514	32583	0.760

*88km flyby of Phobos on 20 Feb 1977; periaxis was lowered to 300km on 11 Mar 1977.

(E) Areocentric orbits - Earth launch (concluded)

Table 2 (continued)

Page 36a

Name	Launch date injection date and ejection date	Mass (kg) and basic shape	Basic size (m)	Date of orbital termination (UT)	Inclination to Mars equator (deg)	Period (min)	Semi major axis (km)	Periapsis height (km)	Apoapsis height (km)	Orbital eccen- tricity
Viking 2* orbiter	1975 Sep 9.78	2325 full	3.3 high	1976 Aug 7.47	55.6	1644.6	22011	1502	35728	0.778
	1976 Aug 7.47	950? empty box + 4 vanes	1.8 wide 1.5 deep	1976 Aug 25.76 1976 Aug 27 1976 Dec 20	55.6 55.4 80	1438.8 1477.8 1590	20132 20492 21520	1432 1502 787	32042 22692 35463	0.760 0.761* 0.806
Viking 2 lander	1975-93C	1975 Sep 9.78 1976 Aug 7.47 1976 Sep 3.96	1090 full 600 empty pyramid	1976 Aug 27	55.4	1477.8	20492	1502	32692	0.761
					Separated from Orbiter					
					Soft-landed at 47.67°N, 225.71°W					

*Passed 23km from Delmos on 1977 Oct 15.

**Orbital inclination changed to 75 deg on 1976 Sep 30, after manoeuvre.

(F) Orbits round Venus - Earth launch

Table 2 (concluded)

Page 26b

Name	Launch date injection date and ejection date	Mass (kg) and basic shape	Basic size (m)	Date of orbital determination (UT)	Inclination to Venus equator (deg)	Period (min)	Semi major axis (km)	Periapsis height (km)	Apoapsis height (km)	Orbital eccen- tricity
Venus 9 orbiter	1975-50A 1975 Jun 8.11 1975 Oct 22.17	3376 full cylinder + 2 panels	-	1975 Oct 22.17	34.17	2898	62910	1510	112200	0.879
Venus 10 orbiter	1975-54A 1975 Jun 14.13 1975 Oct 25.17	3473 full cylinder + 2 panels	-	1975 Oct 25.17	29.50	2963	63810	1520	113900	0.880

The radius of Venus is taken as 6052km.

AMENDMENTS TO RAE TECHNICAL REPORT 73006

Page 3 Add to Census of Space Vehicles table:-

Destination	Launches						Still in orbit on 1 Jan 1978*
	1973	1974	1975	1976	1977	1958-77	
Moon	2	2	0	1	0	64	19
Venus/Mercury	1	0	0	0	0	1	1
Venus	0	0	2	0	0	13	7
Mars	4	0	2	0	0	15	15
Jupiter	0	0	0	0	0	1	1
Jupiter/Saturn	1	0	0	0	2	3	3
Solar orbit	0	1	0	1	0	7	7
Total launches	8	3	4	2	2	104	-
Still in orbit on 1 Jan 1978*	7	2	4	1	2	-	53

*Those launches for which an instrumented payload was in orbit on 1 Jan 1978.
(Rocket debris from 95 out of the 104 launches, 9 moon probes being excluded,
remained in orbit on 1 Jan 1978.)

Country of origin for the 104 launches: USA 53; USSR 49; USA/FRG 2.

Page 7 Luna 1 rocket weight should be 1110kg.

Page 9 Venus 3 orbit should be 0.70 to 1.11 AU? 0.237 4.3 deg? 316 days?

Page 10 Pioneer 7 probably no longer transmits.

Page 10 Venus 4 orbit should be 0.70 to 1.11 AU? 0.237 4.3 deg? 316 days?

Page 10 Mariner 5 probably no longer transmits; add footnote - "Heliocentric orbit after Venus flyby."

Page 11 Pioneer 8: perihelion should be 0.990 AU, and inclination 0.06°. It probably no longer transmits.

Page 11 Pioneer 9 probably no longer transmits.

Page 12 Mariner 6 probably no longer transmits.

Page 12 Mariner 7 probably no longer transmits.

Page 13 Add Venus 7 capsule footnote - "Surface transmissions lasted 23 min."

Page 13 Add to Mars 3 footnote - "Surface transmissions lasted 20 sec."

Page 15 Small booster, 1959 Theta 3, weighs 157kg?

Page 21 Zond 4 weighs 5375kg?

Page 21 Zond 5 capsule weighs 2760kg?

Page 21 Zond 5 compartment weighs 2615kg?

Page 22 Zond 6 capsule weighs 2760kg?

Page 22 Zond 6 compartment weighs 2615kg?

AMENDMENTS (continued)

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- Page 23 LEM 5 (surface experiments) probably no longer transmits.
- Page 23 Zond 7 capsule weighs 2760kg?
- Page 23 Zond 7 compartment weighs 2615kg?
- Page 23 LEM 6 (surface experiments) probably no longer transmits.
- Page 24 Zond 8 capsule weighs 2760kg?
- Page 24 Zond 8 compartment weighs 2615kg?
- Page 25 LEM 8: amend to "T?".
- Page 26 LEM 10: amend to "T?".
- Page 26 Luna 18: add footnote - Damage on landing prevented re-launch of ascent stage.
- Page 27 Luna 20 rocket should be designated 1972-07B.
- Page 27 Apollo 16 command module weighs 5840kg.
- Page 27 Apollo 16 service module weighs 24518kg full.
- Page 27 Apollo 16 rocket weighs 13970kg.
- Page 27 LEM 11 landed on Moon at 8.99° S, 15.51° E.
- Page 27 Particles Subsatellite 2 impacted near 10.16° N, 111.94° E.
- Page 29 Luna 10 retrorocket launch date should be 1966 Mar 31.449
- Page 29 Explorer 35 probably no longer transmits.
- Page 30 Luna 14 basic shape confirmed.
- Page 31 Luna 17 empty weight is 1836kg.
- Page 32 Particles Subsatellite 1 probably no longer transmits. Delete 1973 ejection date.
- Page 32 Luna 19 probably no longer transmits. Basic shape, width and depth confirmed. Height should be 2.3m. Third orbital inclination should be 40.68 deg.
- Page 32 Luna 20 empty weight is 1880kg. (On Moon, including ascent stage).
- Page 32 Delete Luna 20 fragment, 1972-07B.
- Page 34 Luna 16 ascent stage weight should be 800kg? full.
- Page 37 Add to Index:-
- | | | Page/Section | | |
|-------------|---------------|--------------|-----|------------|
| | | A | B | C and D |
| Explorer 49 | 1973-39 | - | 28 | 33 |
| Helios 1 | 1974-97 | 14b | - | - |
| Helios 2 | 1976-03 | 14d | - | - |
| Luna 21 | 1973-01 | - | 28 | 33 |
| Luna 22 | 1974-37 | - | 28 | 33 |
| Luna 23 | 1974-84 | - | 28a | 33 |
| Luna 24 | 1976-81 | - | 28a | 33a and 35 |
| Lunokhod 2 | - see Luna 21 | | | |

AMENDMENTS (concluded)

Page 38 Add to Index:-

		Page/Section	
		A	E and F
Mariner 10	1973-85	14b	-
Mars 4	1973-47	14a	-
Mars 5	1973-49	14a	36
Mars 6	1973-52	14a	-
Mars 7	1973-53	14a	-
Pioneer 11	1973-19	14	-
RAE 2 - see Explorer 49			
Venus 9	1975-50	14b	36b
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Viking 1	1975-75	14c	36
Viking 2	1975-83	14c	36a
Voyager 1	1977-84	14d	-
Voyager 2	1977-76	14d	-

REPORT DOCUMENTATION PAGE

Overall security classification of this page

UNCLASSIFIED

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As far as possible this page should contain only unclassified information. If it is necessary to enter classified information, the box above must be marked to indicate the classification, e.g. Restricted, Confidential or Secret.

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16. Descriptors (Keywords)		(Descriptors marked * are selected from TEST) Space vehicles. Space vehicle orbits.	
17. Abstract RAE Technical Report 73006 lists all space vehicles successfully launched before 31 December 1972. This Memorandum, which supersedes Technical Memorandum Space 242, extends the tabulation to the end of 1977, and gives amendments to Technical Report 73006.			
ABSTRACT			

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